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Math16A Midterm I, Fall 2009

   This is a closed book, closed notes exam. You need to justify every one of your answers unless you are asked not to do so. Completely correct answers given without justification will receive little credit. Look over the whole exam to find problems that you can do quickly. You need not simplify your answers unless you are specifically asked to do so. Hand in this exam before you leave.

Problem	Maximum Score	Your Score
1	20	
2	10	
3	20	
4	10	
5	30	
6	10	
Total	100	

Your Name & SID: _____

Your Section & GSI: _____

1. (a) Factorize the function $f(x) = 3x^2 - 4x + 1$.

   (b) Find the points of intersection of $y = \dfrac{3x^2 - 9}{x + 1}$ and $y = x - 1$.

2. Compute the derivative and second derivative of the function $f(x) = \dfrac{\sqrt{x} - 1}{x}$.

3. Compute the following limits

    (a) $\lim_{x \to 1} \frac{x^{\frac{1}{4}} - 1}{x - 1}$.

    (b) $\lim_{x \to 0} \frac{x^2 - 1}{x^3 + 1}$.

4. Find all equations of the lines of the form $y = x - b$ that are tangent to the curve $y = x^3 - 2x$.

5. Consider the cost function $C(x) = 4 + 3x + 2x^2$ and revenue function $R(x) = 7x + x^2$.

    (a) Compute the marginal cost, marginal revenue at $x = 3$.

    (b) Let $P(x) = R(x) - C(x)$ be the profit. Find $P(x)$ at $x = 1, 2, 3$.

    (c) Can the profit ever be positive?

6. Given functions $f(x)$ and $g(x)$, and assume that they are both differentiable at a. Let $h(x) = 2f(x) - 3g(x)$. Use the rules of differentiation to show that $h'(a) = 2f'(a) - 3g'(a)$.